

COLORADO

FOR

(14)

INVALIDS,

BY

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PREFACE.

The following pages are a reprint of a chapter written for Mr. A. A. Hayes' recent work entitled "New Colorado and the Santa Fe Trail." The object I had in view in writing this short treatise on the Colorado as a health resort, was the same as that of the authors of the various health primers that have lately been published, viz : to present to the general public a brief but comprehensive view of a subject about which they are asking for information. Which view, though the result of scientific research and observation, is expressed in everyday language and is supposed to give the outcome of the knowledge of the subject up to date. The submission to the general public of scientific problems for their solution is wrong, because it requires years of patient labor in science to create the foundation upon which to build a reasonable judgment; and further to address them in the exact phraseology of science is also wrong because it is speaking to them in a language of which they do not even know the alphabet. The learning displayed and the length of the unknown words may impress the uninitiated with the greatness of the author, but the presentation of such treatise to the criticism of the world at large, is usually the action of a charlatan in disguise.

However, the days are past when the physician showed his origin from the medicine man of the tribe by shrouding himself and his art in a mystery too profound for the untutored mind to penetrate and behind which he cloaked his ignorance

with big words and long prescriptions. The laity nowadays wish to know the why and wherefore, and the profession, even if it desired to, can not restrain them from drinking of the Pierian spring. As the legitimate custodians of that property the task is ours to guide them to the genuine fountains and to see that they receive the beverage untainted. It is well and proper that men of science should from time to time take stock as it were, of what is known or believed to be true by them of a subject which they have made a special study, to see where it fits into, and how much of it can be added to the fund of knowledge possessed by humanity at large. In the endeavor to make such additions the scientist marks out the guiding principles of the subject and avoiding all bye paths and wanderings off into the maze of speculation, so peculiarly seductive to him as a student of science, and, in the happy phrase of Oliver Wendell Holmes "de-crystallizing" his words and ideas, he renders them into the vernacular, and gives to the world at large the outlines of the subject which they can fill in according to their ability and industry. This common sense knowledge may consist entirely of absolutely proven facts, or it may be, as in the following treatise, a statement of such facts as are known, to which are added the opinions the author has formed from them, joined with his own experience in the matter. In such a case the reputation of the author enters into the question of value of the statements made. In the subject herein discussed so little is at present absolutely known that can be proved beyond question, that all that can be said of much of what is stated, is that it is the outcome of six years study and personal experience of the matter and must be accepted as the sum of the present knowledge of the subject as far as the author comprehends it.

By far the greater number of invalids select a climate from their own reading concerning it, or the experience of lay friends, and not by the more safe process of consulting their physician. It is with the hope of showing these that there is more in the

subject than they are apt to think, to correct some commonly erroneous opinions and to instill some true ones that these pages are presented to the laity at large. The most frequent delusion about climate, both among the people and the doctors, is that a climate for health purposes must be like the country of the Lotos eaters "in which it seemed always afternoon." But climates like other remedies are often very opposite in their qualities though alike in their results of restoring health. So let no one come to Colorado to find equability of temperature, luxuriant nature and balmy zephyrs. The invalid will find the road to health through Colorado often rough and uneven, but, if he has chosen with discretion hope shines on it, and experience promises health to greet the traveller at the end.

COLORADO SPRINGS, COLO., Nov. 30, 1880.

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What is "change of climate," of which so much is spoken? It is often the last infirmity of a baffled doctor or a bored patient. What does the wanderer seek, and of just what does this change consist? The essence of change of climate is undoubtedly in a change of the air we breathe, and the soil we move upon, and also in the amount and intensity of the sun's heat and light to which we are exposed. These three embrace all the physical conditions: there are, of course, the secondary results more or less connected therewith—such as the change of scenery, modes of life, thought, food, and water.

The simplest change we can make in the air we breathe, is to remove from the vitiated atmosphere of a city into the country air. It is a *sine qua non* in change of climate that the atmosphere shall be brand new, so to speak; that it shall not be the second-hand article abounding in crowded places; and that it should have abundance of oxygen to destroy any poisonous germs which may float in it. We find these conditions most completely filled on the sea shore or the mountains. In both situations there are vast spaces over which the winds of heaven blow without being used by man or beast, so that there is always plenty of the genuine article brought to one's doors. If, however, the air were always still, we would soon use up the atmosphere around us, and it would be very slowly replaced.

One of the chief reasons, therefore, that sea or mountain air is so healthful, is that there is constant change of atmosphere, giving always pure air, and stimulating the vessels of the skin and lungs to hurry the blood along its course and renew its vitality by restoring its oxygen at every breath. Therefore let no man speak ill of the "stormy winds that blow," even if he lose his hat by the same.

Next, let us consider the *quantity* of the air, for the atmosphere is a ponderable elastic body, and as that which is at sea-level is pressed upon by the air above it, it is much condensed, and there is more oxygen, nitrogen, and watery vapor to the cubic inch at the sea-shore than on the mountains.

The rarity of the air which is found on the mountains has special effects. It compels one to take more fresh air into the chest at each breath to procure the amount of oxygen which would come from a lesser quantity of air at the sea-level. Perhaps it would be well here to refer briefly to the mechanism of breathing. The reason that we carry on this ceaseless occupation is that oxygen may be absorbed by the blood, and carbonic acid and water given off. This process is effected through the law of osmosis. If a moist permeable membrane be interposed between two fluids or gases of different density they will change places. The lungs are composed of innumerable blood-vessels, held together by the slightest possible membrane in such a way that cells are left between them, into which the air can enter, and every vessel is thus practically surrounded by air. The walls of these vessels consist of such a membrane as this, so that we have all the conditions for osmosis—on one side of the membrane the blood containing carbonic acid and watery vapor, and on the other, air containing oxygen. The air, to reach the lungs, has to pass through the mouth and windpipe into the chest, where the tube divides up into smaller tubes, called bronchi; then into still smaller ones, called bronchioles; and so finally into minute ramifications which end in an air cell. The lungs and heart are con-

tained in the chest, which is a conical expanding box ; its floor is of muscle—the diaphragm which separates it from the abdomen. The regular contractions and relaxations of this muscle cause the floor to go up and down, and keep up a constant entrance and exit of air into and from the chest. The sides are made up of ribs, which run round the chest like hoops cut in half—being fixed at one end to the spine, and at the other end able to be lifted up and down by muscles—thus increasing and diminishing the capacity of the chest. The air which the chest contains at any given time during life may be divided into three strata. The lowest is never directly changed, so that there will always be some air left in the chest. Then comes the middle stratum, which is only changed on violent exertion, and the upper stratum, which is constantly changing. We can, therefore, see that under certain conditions we take in more air than usual. And the breathing of rarified air produces increased chest expansion.

Then comes the all-important element of moisture in the atmosphere. The variation of humidity, in different climates, has most to do with their peculiarities. The effect of much watery vapor in the air is to retain heat or cold, so that they are each in turn more acutely felt. It is known that a much higher temperature can be endured in the Turkish dry air bath than in the Russian, or vapor bath. This element of moisture in the air supplies the reason why we often fail to get comfort and support for our sensations on applying to the thermometer. Although heat and cold are more acutely felt in a damp climate, yet the changes, being slower, are less perceptible. The moisture retains the one or the other for a long time after the cause is removed, as by sunset. In a very dry climate the change from sunshine to shade is so marked, that it appears as though divided by a knife. Then, as regards the bodily electricity in the two climates, there is a marked difference. Without going into the why and wherefore, suffice it to say that a damp air is constantly robbing the body of its electricity, being a good conductor ; while the dry air, being a non-conductor,

allows it to be retained in the body. Therefore, in a dry air the nervous system is kept in a state of tension, while in a damp air it is relaxed. Consequently, full-blooded nervous people are better in a damp climate, and thin-blooded lethargic folks are happier in a dry one.

Next comes the question of perspiration. This is a process fulfilling two different objects. In the first place it is a means of getting rid of waste products from the body through the vehicle of water, and the skin is studded with innumerable glands for secreting fluid. When this function is checked a variety of ills may result. The other function is that of moderating the temperature of the body by evaporation, accounting for the relief sweating affords us in hot weather. This evaporation, again, is governed by the law of osmosis—and when there is an atmosphere filled with moisture outside of the skin, and inside a fluid trying to get out, the water on both sides of the skin will not change places. The air has a natural tendency to absorb moisture, but it can only take up a certain amount. Therefore, we find that in a damp climate, although the perspiration comes through the skin it remains on it, clogging the pores, as the air can not take it up; but in a dry climate it is common for people to declare that they never perspire. The fact is that they probably perspire more, but that the air, being without water of its own, greedily takes up what passes from the skin, so that the evidence does not remain upon the surface of the body. This rapid and constant evaporation of moisture from the body in a dry atmosphere, probably accounts in most part for the fact that persons in an equally good condition of health weigh less while residing in a dry climate than in a moist one. As with the skin, so with the lungs; where there is much moisture taken into the lungs, the watery vapor and gases are not readily given off, the blood does not get sufficiently aerated and the circulation is slow. On the other hand, in a dry climate, the action of the lungs is especially active and complete.

The amount of moisture in the air also influences the sunlight in two different ways ; first, because the light can not shine as brilliantly through an atmosphere charged with vapor ; and secondly, because the formation of clouds and fogs obscures the sun's rays more frequently, and the influence of sunlight upon the body is quite an important element in the proper discharge of its functions.

With regard to the effect of the sun's heat upon the body : the direct rays of the sun shining through a dry clear atmosphere are not as liable to cause injury to the body from excessive temperature as the indirect effect of the sun's heat, when the sun itself may be more or less obscured by clouds and vapor. This is shown by the rarity of sunstroke in dry climates, even when the temperature is high, as compared with its frequency in moist climates at a lower temperature. The power of enduring heat varies greatly in individuals ; some always feel better in the summer, and some in the winter. The general effect of moderate heat is to quicken all the functions of life and stimulate healthy growth, but excessive heat relaxes the nervous system which governs those functions ; and therefore, great irregularities ensue ; some organs acting excessively, and others being more or less paralyzed. Morbid growth, as in disease, is generally stimulated, and natural increase often arrested. The general effect of moderate cold is to limit growth, but make its quality good ; to strengthen the control of the nervous system over the body, and to check morbid processes. Excessive cold does not produce irregularity of function, like heat, but tends to paralyze and kill all life.

We know how important is the question of soil in choosing a habitation. A dry soil is always preferable, and, therefore, gravel is the best, and clay the worst. Apart from the questions of dampness and drainage, there is now arising in science a point which may in future prove of great importance to the sanitarian, viz., that of the quality of underground air (the air permeating the soil for some distance below the surface), but at present this study is in its infancy.

In connection with the soil there is the question of vegetation. On dry soils the pines are apt to grow, and they are undoubtedly a help to those who require a dry climate. In moist climates the luxuriant deciduous foliage increases the mildness of the air, and in hot ones it gives shade.

The purity of the water is an important element in the choice of a climate, and the purest water is usually found flowing through the gravel. In clay the soil and decaying vegetation are apt to mingle with the water and spoil its quality.

With change of climate often comes change of food; and, although the changed food may not be any better (or as good) for the traveller, when in his usual health, than what he has left, yet the old saying, "When you are in Rome, do as the Romans do," is usually a good dictum to follow. The good effect of a climate has often been marred by the visitor importing with him the cuisine of other climes.

Having now arrived at some idea of what is meant by change of climate, let us consider, in a general way, what the wandering invalid seeks. It is not relief or cure from any acute illness or suffering; for the change of the physical conditions which we have been considering could only act slowly, and they are only a change in degree from the conditions under which the patient is at home. It must be some chronic malady—some bad habit of the body, (for the body, like the mind, is prone to keep on in an evil course if once started in it)—some tendency contrary to the stream of healthy life which drives the sick man from home to seek, not a single element or medicine to antagonize the evil that is in him, but some slow, subtle influence which will in time bring back the machinery of his body once more into gear.

Let us see what we have in this climate of Colorado to make its name so great a sanitarium. This name has been made—not by the doctors discovering and testing its properties and recommending them for certain diseases, but by the sick themselves, coming of their own instinct, as it were, over

the great plains ; many falling by the way, but many more, after much privation, finding health and strength, and staying to build up a new state with their own labors. It is often estimated that a third of the population of Colorado came for their health and that of their families, and probably the estimate is not excessive. But this climate, like many other blessings, has often been misused, because of the popular idea that, like a patent medicine, a health resort must be a panacea for all ills. On the other hand, its striking qualities, like two-edged swords, cut both ways.

We have in Colorado a dry, bracing, cool climate, with an abundance of sunlight, and an aseptc and highly electric atmosphere, at an elevation varying from four to eight thousand feet. Beautiful mountain scenery and the vast plains are there to supply us with unlimited air, untainted by cities or vegetation. The rain and melted snow fall for the year along the foot-hills averages fifteen inches, while those of New York are forty-four inches, Boston forty-five inches, and St. Louis forty-two inches. As regards humidity--by comparing the actual number of grains of vapor to a cubic foot of air, we find that at Denver, which may be taken to represent the climate along the foot-hills of Colorado, the average for the year is 1.13 grains, as against 5.11 grains at New Orleans, 3.98 grains at Santa Barbara, and 2.35 grains at Philadelphia. We can, therefore, without further question, call Colorado's climate a dry one. In looking over the maps of " Lombards Medical Geography," it will be found that wherever the shading indicates much moisture, there is an excess of consumption among the inhabitants; and the two things, moisture and consumption, will be found to stand in the same relation to each other all the world over. Then, in further examining these said maps, it will be found that with increasing elevation of the land comes a decreasing amount of consumption; so that in the highlands, where the climate is dry, consumption is a disease unknown among the natives. With this small rainfall come a great many clear days, there being no less than three hundred and two in the year,

thus allowing of much out-door exercise. With regard to temperature, the mean annual of 47° marks this as a temperate climate.

It has been pointed out elsewhere that cold is more advantageous than heat ; and this is especially so as regards pulmonary disease. Heat lessens the number of respirations, and causes them to be more shallow ; and one of the great causes of consumption is, as it has been aptly called, a consummate stinginess of breathing. The great trouble in consumption is the stagnation of imperfectly aerated blood in the lungs, giving rise to low forms of inflammation, and consequent pouring out from the blood of morbid material, such as tubercule, into the air-cells or their walls ; or a blocking of the air tubes with deposits of unhealthy plastic matter ; or else, as in fibroid phthisis, a thickening of the lung tissue, so that it loses its elasticity, and the air-cells become contracted. All this leads to consolidation of the organ ; consequently the lung, instead of being like a sponge, into which the air can freely penetrate, becomes solid, like the liver. The first objects to be obtained are to cause the lung to expand again, and once more take in air, and to stimulate the circulation, so that these objectionable deposits which clog the efficient working of the organ may be absorbed into the blood again. This is largely done by getting rid of the carbon, which forms the basis of these deposits, by admitting oxygen into the chest, and allowing it to unite with the carbon and pass off in the form of carbonic acid gas. Cold, therefore, by stimulating the pulmonary circulation, tends to repair the mischief already done and prevent the further development of the process. This question of heat and cold is one of degree, however. Cold is only good when it produces a reaction. This is exemplified in the use of the matutinal tub, whose praises the English so loudly sing. The cold sponging is good, as bracing the circulation of the skin and stimulating the nervous system, when the bather leaves his bath in a glow and sits down to breakfast with warm feet. But if he emerge from the tub with blue skin, and eagerly seek the

fire, he had better have taken a warm bath. The question of heat and cold, also, is not so much a matter of degrees of Fahrenheit as of the amount of humidity in the air; and, therefore, if the cold be dry and not extreme, its depressing effect is absent. So it is, also, with the individual exposed to it; he must have sufficient vitality to produce a reaction. This point—that cold is preferable to heat—is the reason that consumptives do better here in winter than in summer. Dryness also improves the pulmonary circulation: by causing a greater amount of watery vapor to be got rid of, it lessens the distension or congestion of the blood-vessels, and tends to dry up the excessive mucus which may be secreted in the bronchi or air-tubes, and which, in consequence, obstructs the free passage of air to the cells. It was explained elsewhere that with dryness we have a higher degree of animal electricity; and, therefore, the nerves of the chest would respond more vigorously to the stimulus of the air.

It is, probably, impossible to get much further without talking about *ozone*. The latest investigations have proved that pure dry oxygen can be converted into ozone by electricity. It is therefore probable that ozone is “electrified oxygen.” Schönheim’s test—the only one at present used—requires the presence of atmospheric moisture. No doubt this is the reason that in a dry climate, such as Colorado where the indirect evidence is strongly in favor of the presumption that there is considerable ozone in the air, this test fails to reveal it. Ozone shows that there is an excess of oxygen in the air, and, therefore, that the atmosphere is specially pure. Ozone itself is a powerful antiseptic and disinfectant, and its presence in mountain air is no doubt one of the reasons why wounds tend to heal with a minimum of suppuration. When the Colorado traveller passes—as often he will—the decaying carcass of horse or cow, he may bless the electrified oxygen which tempers the wind to his olfactories. Ozone, being absorbed through the lungs, purifies the blood, and prevents the individual from being poisoned by the effete material arising from the renewal of the various tis-

sues. The reason that to be among the pines is good for invalids, is supposed to be because the turpentine exhaled from them has a special power of converting oxygen into ozone.

Let us now return to a brief consideration of that fell disease, consumption, which is computed to cause annually fourteen per cent. of the deaths in this country. We have shown that, in the beginning of this disease, there is a deficient amount of air entering the chest. This may arise through the individual living in a damp, relaxing climate, and taking very little exercise, and, therefore, not stimulating the muscles and nerves of his chest to expand the lungs; or, though he may expand them sufficiently, the air he breathes may be so impure that he can not absorb enough oxygen from it. For instance, a workman in a factory may use enough exertion to expand his chest, but the atmosphere he works in may be poisoned by overcrowding or the effluvium from some manufactory. Again, it may happen that the individual, though breathing a pure air, may fall a victim to inflammation of the lungs, or some other acute affection of the chest; and, as he has a scrofulous tendency, the results of the inflammation are not absorbed into the blood but remain, obstructing the proper expansion of the lungs and degenerating into permanent morbid deposits which, after a time, by becoming a source of irritation, cause the lung to consume.

There is another cause of consumption—next to foul air probably the most prolific—dyspepsia. Dyspepsia, which is an imperfect action of the digestive powers of the stomach and bowels, may arise when there is general weakness, or what is called *anœmia*; that is, when the blood supplied to the organs of digestion is deficient in quality and quantity, and the food given is too great in amount or too rich in quality. Not being thoroughly digested, it then becomes only an irritant to the mucous membrane and sets up a catarrh or chronic inflammation of them; in which case their power of absorption is so much diminished that very little nutriment finds its way into

the blood, and the individual is starved. Often the same result is reached by a much more wilful process. The victim of dyspepsia overworks his nervous system in his business and sits down to his meals so exhausted that the nerves of his digestive canal refuse to answer to the stimulus of the food. He probably takes his food not in strata beginning by tempting his appetite with a little easily digested soup, and causing, as Hamlet remarks, "increase of appetite to grow by what it feeds upon," and building up gradually, but piles it all in pell-mell, and benumbs his already too lethargic nerves with liberal douches of iced water.

It was all very well for the London alderman to say, in the course of a discussion on dietetics, "They talks a deal about what you may eat, and what you mayn't eat; but I eats what I likes, and then lets 'em fight it out down below." Some favored ones are blessed with the digestion of an ostrich, but the man who drives his brain, and labors hard in bad air, must have method in his eating. A little wine or beer taken with food will often help him, and prevent the craving for a stimulus on an empty stomach which he is too apt to hold in check with the devil's own peculiar nectar—the too seductive "cock-tail." After such a meal as described—bolted down in hot haste—the victim returns to drive his unrested brain with an indigestible incubus lying in his stomach. The result is that his blood is thin and scanty, and his lungs become starved from want of good blood, as they may be from want of air. There is a notion in the minds of some chemists that there is an oil present in all healthy blood, and that when this is absent, there is the tendency for the blood to form deposits in the lungs and elsewhere. Whether this be so or not is unproved, but it is a fact that one of the greatest difficulties in dyspepsia is the digesting of fatty or oily substances, and that when they can be digested, cod-liver oil and like remedies do much to restore the consumptive. Chronic dyspepsia, being always accompanied by poverty of the blood and an irregular circulation, as might be expected, is greatly relieved by an

improvement in the pulmonary circulation, and, therefore, is benefited by a dry, stimulating climate like that of Colorado.

In continuing our consideration of consumption, we have now to come to that stage which gives the disease its name. After the lung has become obstructed and rendered more or less solid, the extraneous matter thrown out will, under favorable circumstances, become absorbed into the blood, or a portion may become contracted into a close, hard mass, and remain inert for good or bad, for a certain period, or for life; or, it may begin to soften down and be gradually carried off in the expectoration, leaving a cavity which may after a time contract. In this case the patient may get well with so much less lung, or the cavity may go on extending till the drain of this consuming process brings death. The effect of quickening the circulation, and introducing an abundance of oxygen into the blood, is to increase the powers of absorption, and to burn up with the oxygen all morbid deposits. This is why such a climate as that of Colorado tends to cure the early stages of consumption. But when softening is going on, it will also tend to increase that destructive process, and then come in the questions whether the patient can stand the strain; whether there will be sufficient sound lung left; and whether the patient has enough inherent vitality to react under this stimulus—to cast off the old Adam and renew his life. So, also, before softening has begun, but much of the lungs are solid, it becomes a question whether there be enough healthy lung left to breathe with in the rarified air, and whether the softening stage may not be precipitated by a change to Colorado. Dr. Fothergill, in his hand book on treatment, speaks of a process of levelling up and levelling down; by which he means, when an organ is chronically weak, or a function imperfectly discharged, it is sometimes well to grade up the general health, and relieve the general pressure on the peccant part. On the other hand, where the disease is far advanced, any increased excitement of the circulation, or any effort at repair, may but hasten the fatal termination; and it is, therefore, better to somewhat lower the general standard of vitality, and be contented with reduc-

ing the patient to more of a vegetative existence, and so prolonging life. In such cases an equable sedative climate would be better than the stimulating air of Colorado.

These are points, however, which the physician can alone decide. When I first began to study this climate, I was inclined to warn patients against seeking it while their fever ran high and the disease seemed rapidly extending, but experience has taught me to think otherwise, and I have since found that if the other conditions are favorable, the fever and night-sweats are usually speedily arrested, and local signs also abate. The reasons, no doubt, are because the circulation all over the lungs, skin, and body generally is stimulated, and therefore equalized; and the congestion which necessarily accompanies, and in a measure causes, the extension of the local mischief, is relieved. Congestion is a stagnation of blood in one part, and is an essential condition of inflammation. Of course, where the patient is much disturbed or depressed by the disease, it is best to rest frequently on the way; especially once, at least, while ascending the slopes of the great plains.

For some time after arriving it is prudent to remain quiet, and allow the gymnastics which the rarified atmosphere compels the chest to take to supersede the bulk of the accustomed exercise. As might be expected, the cough is frequently increased, owing to the stimulation of the air, and it will, perhaps, remain till the cause of it is removed. The cough is specially apt to be increased when it is mainly due to an irritable throat, for the direct local effect of the dry air upon the throat is of itself somewhat irritating. The effect of the climate upon the shortness of breath from which consumptives suffer, is variable. When the amount of sound lung is small, this symptom is necessarily increased until the obstructed portion clears up. This increase is specially marked where consolidation is extensive, and particularly if of the fibroid character; but often, in cases in which this symptom has been very distressing before coming, it is much relieved. This is, no doubt, where it was due mainly to the air-tubes being filled with mucus, and where the deposits or exudations, being of recent date, are readily ab-

sorbed; the stimulating atmosphere causes the chest to expand, and an abundance of rarefied air can rush into many air-cells which were closed before. As might be expected, the amount of expectoration is usually lessened.

There is a point on which a popular fallacy exists not only among patients, but, alas! also among many intelligent physicians. It is that the tendency to hemorrhage is much increased at such an elevation as six thousand feet. This error has arisen from the observations of Humboldt, who found that bleeding at the nose and ears, and even blood-spitting, were caused by ascending mountains sixteen thousand feet and more in height. Later travelers have recorded the same effects, and consequently the public have generalized so far as to believe that all elevation will more or less increase any hemorrhagic tendency whatsoever. Now, all clinical observations in Colorado and at other similarly elevated health resorts go to show that a patient is less liable to hemorrhage, other things being equal, at this altitude than on lower ground. Strong evidence confirming this statement has been recorded by Dr. J. Reed, in the transactions of the State Medical Society of Colorado. The cause of hemorrhage at elevations has been commonly ascribed to the atmospheric pressure outside the vessels being lessened, the pressure of the blood from within remaining the same, the blood was naturally forced through the walls and bleeding occurred. But scientists have shown that this difference of pressure on the two sides of the vessels walls is so quickly equalized that it probably does not enter into the question at all, and most believe that the cause is the diminution of oxygen acting through the law of osmosis. 14 per cent. of oxygen in the atmosphere is stated as the minimum required for proper respiration. At such elevations as we are considering there is much more than that, and this no doubt is the reason that although we observe marked beneficial effects (in suitable cases) from the scarcity of oxygen, its extreme and dangerous effects, such as hemorrhage, are absent. There is another element which is undoubtedly the frequent cause of blood-spit-

ting in healthy persons while ascending mountains, this is the increased action of the heart, owing to exertion in the rarified air, which is caused in the same way as in a boat race or any other violent manner of over-hurrying the heart at sea-level.

Blood-spitting may occur in consumptives in quite an early stage of their disease or in a late one. In the former case, the deposit or exudation of morbid material into the lung-tissue or air-cells sets up irritation in the lungs themselves, or the tubes leading to them, and gives rise to a congestion or engorgement of the vessels at one part, so that the pressure in them finds relief in a hemorrhage, and the patient generally feels better. This may occur any time when fresh tissue is invaded, and this kind of hemorrhage usually stops of itself. As we have shown, the tendency of dry mountain air is not only to check the morbid process, but specially to equalize the circulation, and so relieve and prevent congestion. In the latter case, when hemorrhage occurs while the lung is breaking down, it is caused by the ulceration extending through the wall of a vessel and making a leak. Therefore, in the one case the cause is from within the vessel, and in the other from without. When the bleeding occurs from ulceration, it is more often alarming and uncontrollable; but even in this case the climate is not usually found to increase the chance of hemorrhage, because it tends to arrest the progress of the ulceration and to remove the cause. Of course, when the danger of hemorrhage in this manner seems imminent, any change combined with the fatigue of travelling would probably precipitate it; although, as before said, there is no doubt that hemorrhages from the lungs are in this climate more infrequent. When they do occur they may be said to be more copious, the patient losing more blood in a given space of time; but there is less liability to continual oozing.

The gist of the benefits that this climate confers on consumptives is its power of getting rid of bad habits of the lungs; causing the absorption of morbid deposits, and setting all the healthy processes of life going with increased vigor. The

question of the expediency of any special case coming, depends probably less on the particular form of consumption, than upon the extent of the mischief, and the amount of reserve force in the patient to stand the stimulus.

When a patient arrives, it is, as has been said, specially important that he should take very little exercise for the first few weeks, but be in the air as much as possible. Horse riding, after the invalid has become accustomed to the air, is an excellent assistance to a cure, if indulged in moderately. In the summer a trip to the mountains is often beneficial, especially on account of the sleeping in a tent. Even where the patient cannot take such a trip, sleeping in a tent close to the house is almost invariably attended with benefit.

An ideal year for a consumptive is best begun about September or October, though a patient may come any time, as the seasons are such that he can remain all the year round. This is a matter of great importance in choosing a climate, for climate-cure is a slow process, taking at least as long for the patient to get well as it has taken him to run down in health, and the influence ought to be continuous. This is not so important, perhaps, in sedative climates, or where the effects are simply negative; but where they are positive, as in Colorado, it is of the greatest importance that the residence should be sufficiently prolonged to give reasonable assurance that the disease, if still present, has at least become inactive. Abraham Lincoln used to say it was "bad to swap horses when you were crossing a stream;" and so it is bad for a consumptive to expose his lungs to a change from this thin air to a denser atmosphere while the process of cure is still going on. It is only too common an experience here for a consumptive to resist all advice and go home soon, only to return worse than ever, and with a greatly lessened chance of cure.

If a patient comes here in the early fall, he has time to pick up strength to enable him to expose himself with advant-

age to the cold of winter, which is at times quite severe. The days are for the most part bright and warm, but the nights are often intensely cold. All the year round they are cool. There is very little snow, and it falls mostly in early spring. On about a third of the days of winter the mid-day meal can be taken out of doors. The great drawback to the enjoyment of the Colorado climate are the winds, which blow mostly in the spring months. Except to the very feeble, however, they are seldom more than disagreeable. There is no rain to be looked for from the middle of September to the middle of April; but there are frequent thunder-showers, lasting seldom more than twenty minutes, in the summer afternoons. These serve to cool the air, but rarely cause sufficient dampness to be an element of danger to the consumptive. In a climate as dry as this has been pointed out to be, the changes of temperature are sudden and extreme, and it therefore behooves the visitor to be always prepared with extra wraps; and it is advisable to qualify the effect of these sudden changes on the body by wearing woolen underclothing and stockings in the winter, and also sleeping in flannel; and in the summer, wearing merino or silk. Although during the summer the thermometer may run quite high, the thin dress used in the East at this season can seldom be worn with impunity.

In deciding the question of coming to Colorado, the condition of the heart has often to be considered. As the effect of the climate is to stimulate the heart to increased action, it is dangerous for persons with any organic disease of the valves or walls to come here. They always require that the rapidity of the heart's action should be lessened, although at the same time it may be well to increase its strength. Of course there are cases where the defect is congenital, or has been borne so long without its progressing, that nature has entirely accommodated itself to the condition. Such cases, which are rare, we occasionally find living here without apparent injury. Cases of what is called fatty degeneration, or any case where the muscle of the heart shows signs of breaking down, should

stay away ; but where the muscle is simply weak, as the other muscles of the body are weak, a visit to Colorado will often prove beneficial. Such cases on first arriving have specially to avoid exertion ; and if an attack of irregularity of the heart's action comes on, it is liable to be exaggerated. The tonic effect of the climate will, however, probably remove the cause, and so relieve the trouble.

In neuralgic affections of the heart—angina and the like—the stimulating effect on the nerves commonly increases the distress. Where the nervous system generally has run down, and the heart in consequence acts irregularly, persons will receive benefit. Asthma is always relieved in this air, more or less in each individual case according to the elevation. Heart disease is a frequent consequence where asthma has existed in a severe form for some years. Such cases, if they observe great care, are often better here than at home, since the cause of their distress is removed.

Cases of nervous exhaustion, from whatever cause, are almost invariably relieved ; and all irregularities of the nervous system dependent upon a bad circulation, defective nutrition, scrofula, or poison (such as malaria), are also benefited ; but when they occur in persons of good circulation and full habit, the symptoms are increased. Even in the cases which are ultimately cured by a residence in Colorado, before the cause is removed the attacks are usually more severe when they occur, though happening less frequently. Acute organic disease of the nervous system is made rapidly worse by this climate. Some stationary chronic cases will improve in general health, but it is not well to advise their coming. With regard to rheumatism of the joints, it exists here as it does all the world over, and there would be nothing gained by coming specially for that, were it not that scrofula is probably the parent of the bulk of cases of rheumatism ; and as this climate is its deadly enemy, the rheumatism may indirectly be removed. Then again, where there is much debility, benefit is gained. But in this disease, as in all others, the type of indi-

vidual has much to do with the choice of climate; the florid and full-blooded had better seek the sea-shore; the dark, pale, and anæmic climb the uplands. When gouty or rheumatic deposits exist around the joints or elsewhere, the type of individual must again decide the question; the alkaline waters of Manitou are undoubtedly a great aid to their removal.

In liver derangements, the anæmic or debilitated sufferers usually improve, and the full-blooded grow worse. In actual disease of the liver, this country should not be sought.

In acute kidney disease this climate is to be avoided, but in chronic disease or derangement benefit is often gained.

With regard to throat affections and nasal catarrh, the direct effect of this dry air upon the mucous membranes is to increase the irritation; but where the condition is largely dependent upon general want of tone, the local effect can be modified by treatment, and the beneficial effect upon the constitution generally obtained.

Most skin-diseases in the anæmic are improved, owing to the cutaneous circulation being more equable and vigorous.

Brief mention has now been made of most of the maladies in which the question of change of climate might arise. The broad principle is as follows: send the thin-blooded to Colorado; keep the full-blooded away. Send those on the up grade of life, and not on the down. In disease, except in that of the lungs, where there is active change of structure, avoid the too rapid life which this climate causes.

Colorado is divided topographically into three divisions—the plains, foot-hills and mountains. The plains present little or no vegetation beyond the buffalo grass, and are only watered by small and infrequent streams. Their elevation varies from three thousand five hundred to four thousand five hundred feet. There are no accommodations to be found in this portion of the country specially for invalids; but when a patient is able to stand the rough living of a sheep or cattle ranch, and the monotony of the life does not pall, he is often cured by the pure air of the plains. The foot-hills average

from four thousand to seven thousand feet in elevation, and have several towns and villages among them which attract the bulk of the invalids. They are of medium elevation; best adapted for the majority of patients, and most suitable for residence in both summer and winter. The chief of these are Denver, Colorado Springs, Manitou, Pueblo and Cañon City.

Denver, the northernmost of these places, stands about fifteen miles east of the base of the mountains, and at an elevation of five thousand two hundred feet. It is a rapidly growing city of about thirty thousand inhabitants; it has fine streets, good hotels and boarding houses, and capital markets; it possesses places of entertainment, and its society is pleasant; it has, however, the objections to an invalid which attach to a city. At present its water supply is by no means above suspicion, and its system of drainage is imperfect. On the upper ground there are attractive spots for residence, but the soil in the lower part of the city retains moisture to a degree that in any other climate would be dangerous to health. There are some small places around Denver which are good resorts, but there are no objects of interest in the immediate vicinity to drive or ride to, though the roads are good. If a city life seem indispensable to the happiness of the invalid, or engaging in business be a necessity, Denver is the best place in Colorado; but even in this pure air man is vile when you get too many of him in a small space.

Colorado Springs also aspires to be a city, but at present six thousand is probably a liberal estimate of the number of its inhabitants. Unlike Denver, however (which owes its origin to chance, and has grown up by force of circumstances), Colorado Springs was laid out nine years ago by a company with the special view of its becoming a health-resort, and its very existence to-day is dependent on its attractions as a sanitarium. Its altitude is six thousand and twenty-three feet. It is situated on a plateau five miles from the base of the mountains, sheltered on the west by the range, on the east by bluffs, on the north by a spur from the mountains called the Divide, and on

the south-west by Cheyenne Mountain. The town is spread out over an area of four square miles, so that there is plenty of ground round most of the dwelling houses. The streets are wide, and lined with shade-trees. The plateau on which the town is built has two water courses, dividing on the north and joining on the south. The ground has a gentle slope from north to south, but is otherwise almost flat. There is a top soil of about two feet, beneath which are sand and gravel to a depth of about seventy feet, when clay is reached which has a good slope to the south—the direction of the water-shed. The gravel is extremely porous, so there is perfect natural drainage. There are no springs in the soil, and no water could be obtained in wells until it was brought on to the plateau through irrigating ditches. Before the town was laid out nothing but buffalo grass grew on the site, but now a variety of trees, and lawns, and gardens flourish. Besides the water conveyed in ditches for irrigating, pure water is brought in iron pipes from Ruxton's Creek, six miles away on the mountain side, where it is free from all contamination; the supply is practically unlimited, and the pressure is such that fire can be extinguished without engines. There is at present no regular system of drainage, and thus far none has been needed. As no water is taken from the soil, the system of earth closets mainly prevails. They are cleaned out by the town scavengers with fair regularity. The death rate, exclusive of deaths from consumption, is very low, being only 5.6 per 1,000; from zymotic diseases, 1.6 per 1,000.

There are several hotels (but none first-class) and many pleasant boarding houses; and comfortable villas can be rented. The food is good (the farm produce especially), and moderate in price, but luxuries are dear. There are good liveries, and the rides and drives are numerous and interesting. Society is pleasant; entertainments are frequent; and the schools and churches are excellent.

Manitou lies five miles to the west among the foot-hills, close under Pike's Peak. It is a village of five hundred people;

it contains three first-class hotels and several fair boarding houses; and a few cottages are to be had. The horses are excellent. The village is thronged with visitors through the summer months; it is somewhat cooler and less dry than Colorado Springs in the summer, and warmer in the winter; though, owing to the shadow of the hills, the hours of sunshine are shorter. It stands about two hundred feet higher. The springs from which Colorado Springs derives its name are really here. They all contain more or less soda and some iron. They are peculiarly adapted for the dyspepsia of the consumptive, and the Iron Ute Spring is specially remarkable for its blood-making properties.

Pueblo is hotter, dustier, and more windy, but drier than the Springs. It has very few attractions, but the warmer winter weather suits some invalids.

Cañon City stands about fifteen hundred feet lower and is warmer and more sheltered than the Springs, but there is much clay in the soil, and when snow falls it is not so healthy. It is well suited in some cases for winter residence, but an uninteresting place. Here also are springs resembling those of Manitou. They are not efficient for drinking, but there is an excellent thermal soda spring for bathing.

During the summer there are many places in the mountains open to invalids, such as Idaho Springs, and Estes and Manitou Parks, where good hotels are to be found; and there are numerous good boarding-houses scattered through the mountains. A change to these elevations is generally attended with benefit in the summer; but it is seldom wise for an invalid to go higher than the foot-hills till he is thoroughly acclimatized.